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SWFSC / FRD

10.2 Fishery-Independent Data Used in Tuna Stock Assessments

Suzanne Kohin, Leader of the HMS Biology, Survey and Data Management Groups

Tagging Data

- Conventional
- Electronic

Life History

- Age and Growth
- Stock Structure
- Reproduction/Maturity
- Foraging Ecology

Environmental



Albacore Archival Tagging

Deployments to Date - 801 Archival (+ 43 Dummy)

Oregon / Washington / No. CA

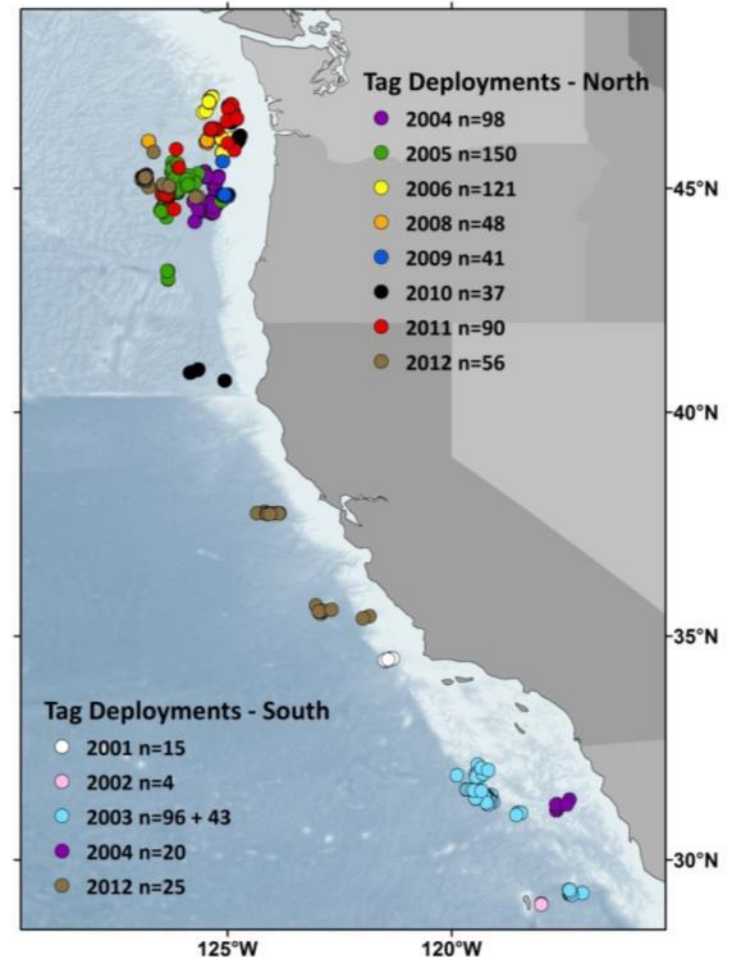
Total Deployed North: 641

14 Recovered

Southern CA / Northern Baja

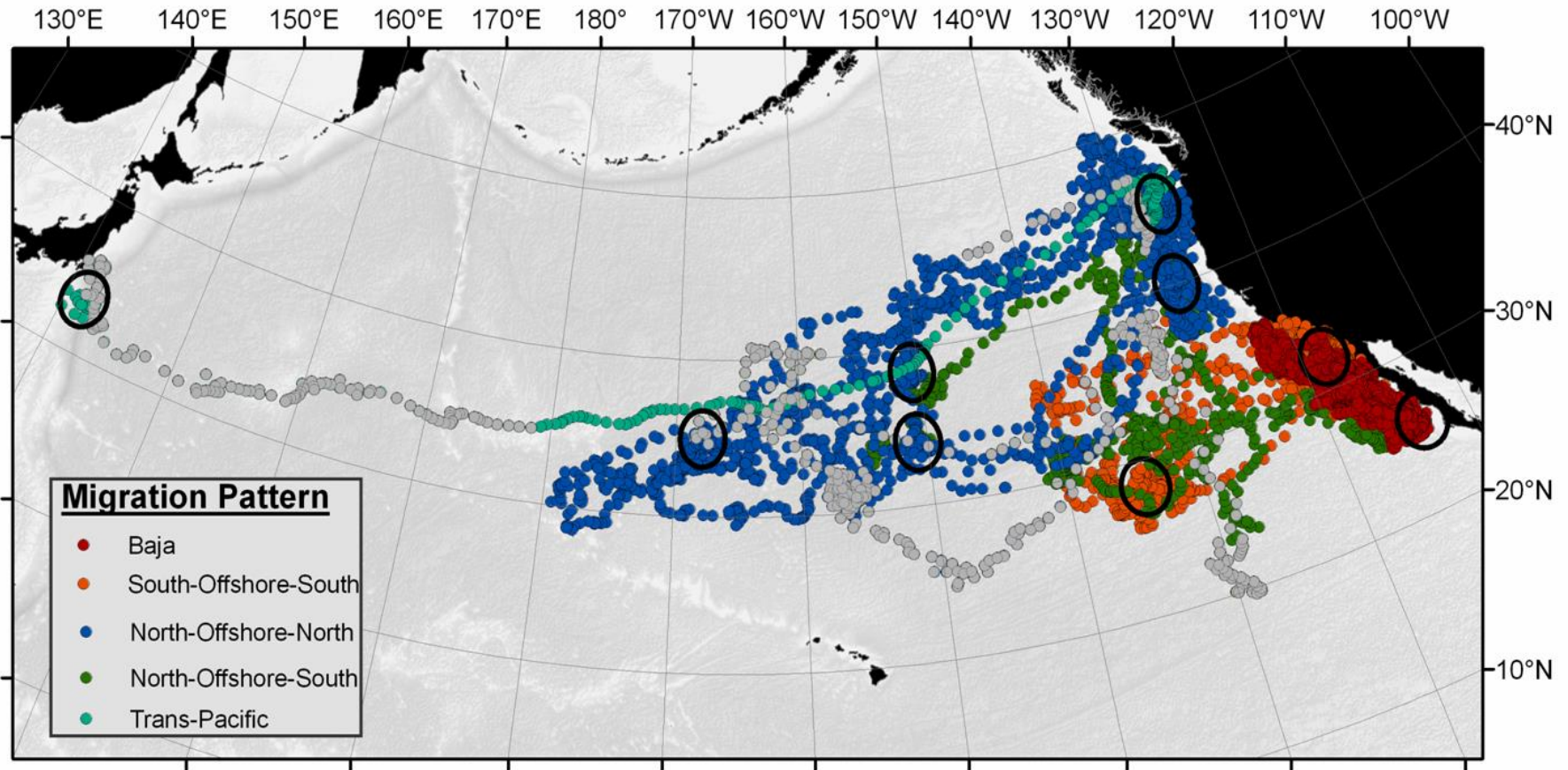
Total Deployed South: 203

11 (+ 6 Dummy) Recovered



Movements: 20 fish, 5 migratory patterns

Site Specific Behavior in Focal Areas



Data Collected

- Date, time and location
- SST
- Fish fork length
- Capture method and condition
- DNA sample collected
- Tags (archival and conventional)
- Vessel, Captain and tagger

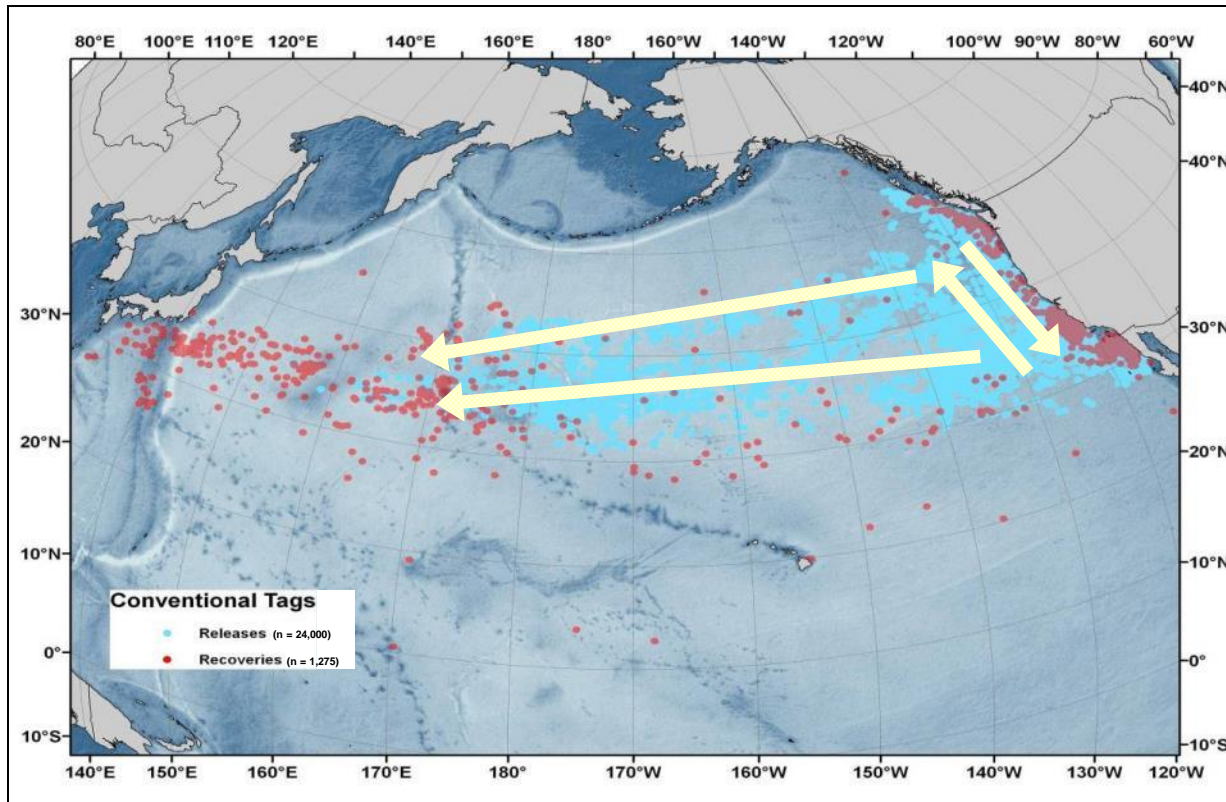
Data Archives

- Single Access database for all deployment data
- Individual Access databases for each recovered archival tag
- Individual tag databases are linked into deployment database for summarization purposes
- DNA data archives are managed separately
- Multiple files generated during tag testing and analysis



Albacore Conventional Tagging

- Conventional tagging conducted, 1970-1995
- Collect information on growth rates, stock structure and movements
- Results demonstrate incomplete mixing of substocks



Recaptures:

N to S – 13%

N to N – 28%

N to W – 54%

S to N – 8%

S to S – 75%

S to W – 10%

From Laurs and Lynn, 1991

Biological Sampling of Whole Fish

Studies aim to address:

- Age and growth - otoliths, dorsal spines, scales, vertebrae
- Foraging ecology - stomach analysis and liver, heart, muscle tissues
- Maturity and reproductive state - gonads
- Stock structure and migration patterns - DNA, otoliths, tissues



ISC North Pacific Biological Sampling Plan

[illegible]

Data/samples	logbook	measures	biological samples	Sample storage		
Date		Fork Length or Eye Fork Length (cm)	otoliths/fin rays (1st dorsal)	Buffered 4% formaldehyde (10% Formalin) for gonad tissue (first choice)		
Lat/Long		Total weight	Preferably whole gonad tissue (frozen);	95% ethanol, DMSO for muscle tissue		
		Gonad weight	but if sub-sampled, then procedure needed for where and what to slice is needed			
		Sex	Muscle/tissue samples for DNA/lipid, etc. analyses			
		Photo for identification, depending on species and country				
		Albacore (ALB)	Swordfish (SWO)	Striped Marlin (STM)	Blue Marlin (BUM)	Pacific Bluefin (PBF)



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Fish collected onboard cooperating commercial and sport vessels and at auction

Species	2007	2008	2009	2010	2011	2012
Pacific Bluefin	0	75	78	54	189	294
Albacore: Washington/ Oregon	0	0	42	191	49	60
Albacore: Central California	0	0	0	0	27	31
Albacore: Southern California	116	35	93	118	7	62
Yellowfin	15	45	95	71	128	132
Skipjack	0	5	9	8	15	16

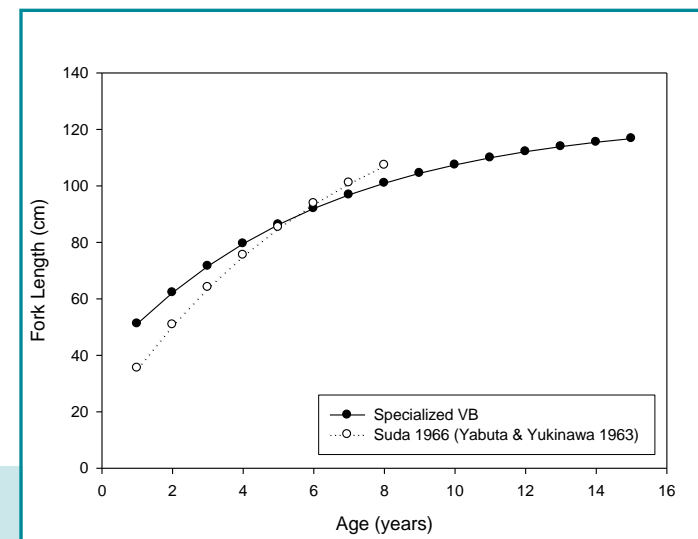
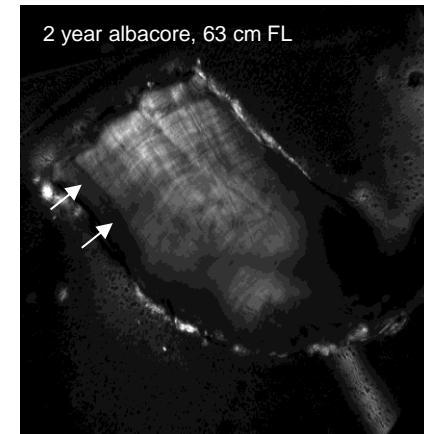
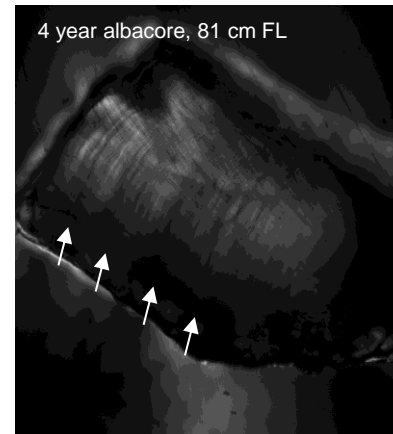
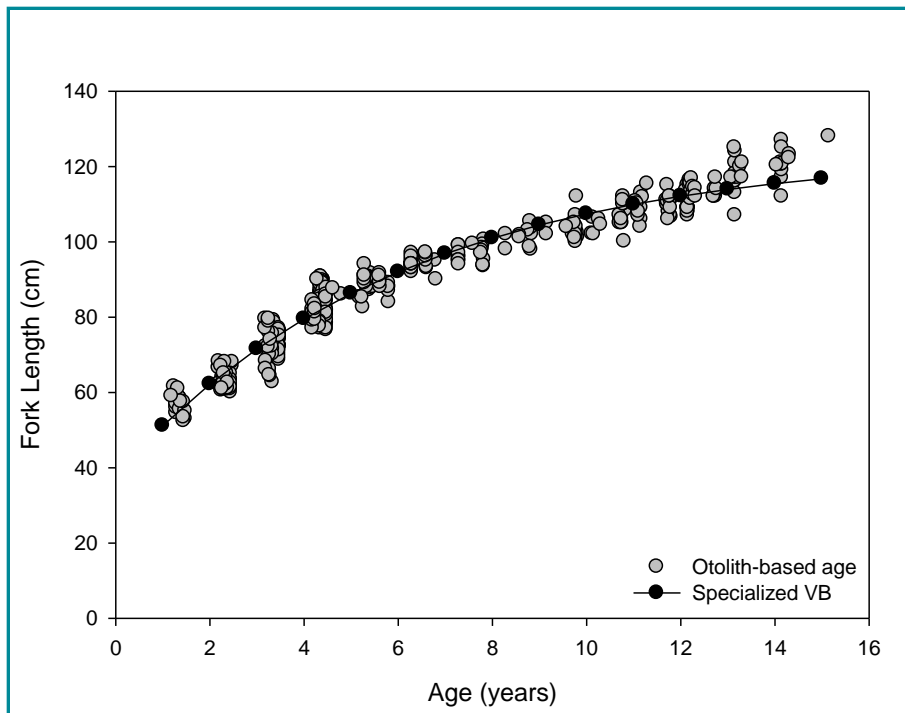


Fish Sample Number	Date (MM/DD/YYYY)	Time of Day	GPS Location (DD°MM' DDD°MM')	Fork Length (CM)	Gear Type (bait or Troll)
191	09/29/2010	1200	45.34 127.49	52	Bait
192	09/29/2010	1200	45.34 127.49	54	Bait
193	09/29/2010	1800	45.08 128.08	56	Bait
194	09/29/2010	1800	45.08 128.08	56	Bait
195	09/30/2010	1000	45.02 128.00	60	Bait
196	09/30/2010	1000	45.02 128.02	61	Bait
197	09/30/2010	1000	45.02 128.02	60	Bait
198	10/01/2010	1350	45.11 125.05	66	Bait
199	10/01/2010	1350	45.11 125.05	62	Bait
200	10/01/2010	1350	45.11 125.05	60	Bait



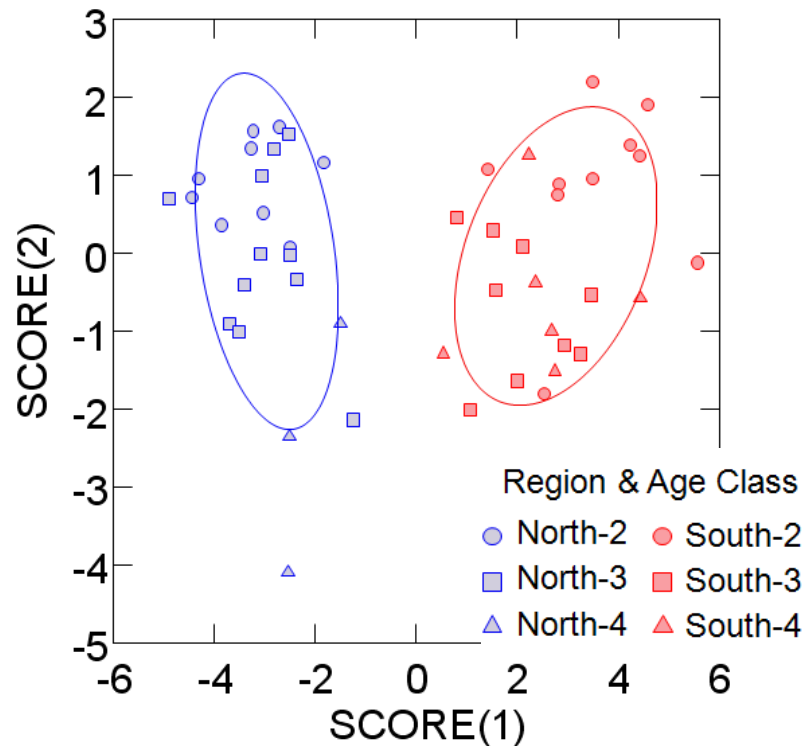
Albacore Age and Growth

- Otolith ageing helped define new growth curve
- Samples combined with some collected in Japan and Hawaii (n=486)

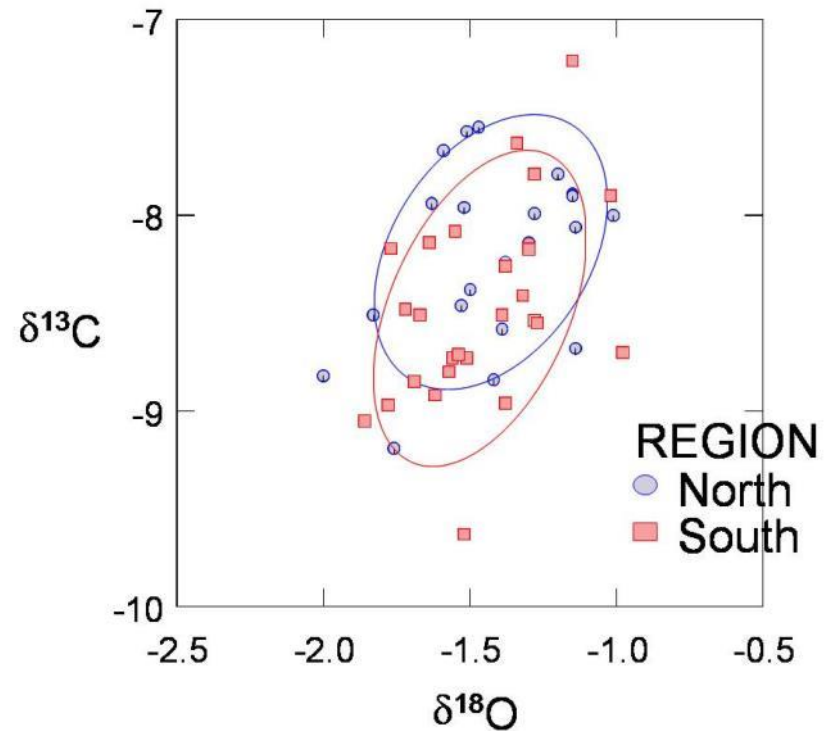


Albacore Otolith Chemistry

Stable isotopes and trace elements in the water column are assimilated into otoliths during growth. Whole otolith microchemistry points toward stock separation in EPO during first 4 years. Otolith core chemistry suggests overlapping natal origins. More work is needed on larval and young-of-the-year fish collected near spawning grounds.



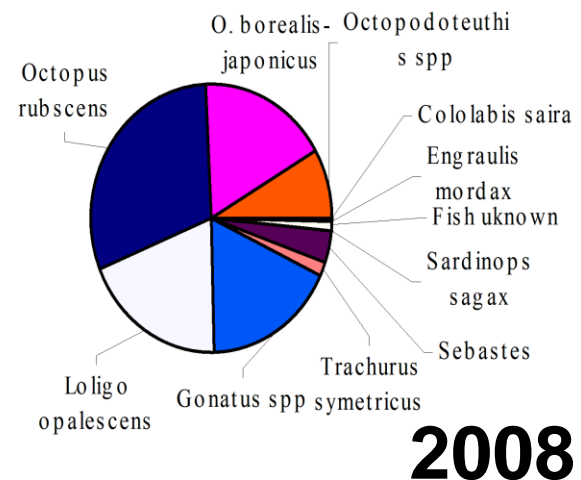
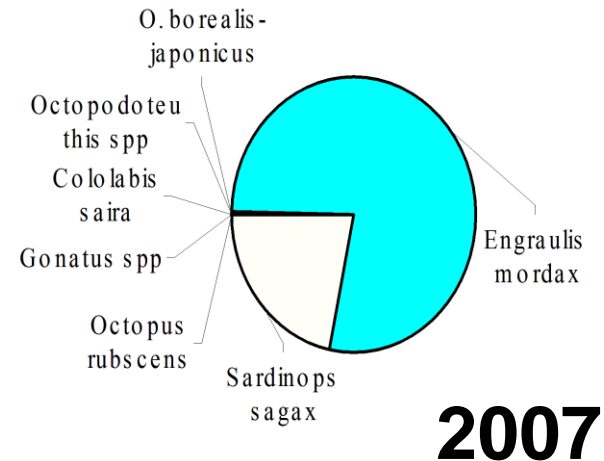
Whole otoliths: 100% correct classification success



Core: chemistry suggests no difference

Albacore Stomach Sample Processing

- Demonstrates inter-annual variation in diets
- 2011 stomachs contained gonatid squids, anchovy, and lots of small amphipods



Data Collected

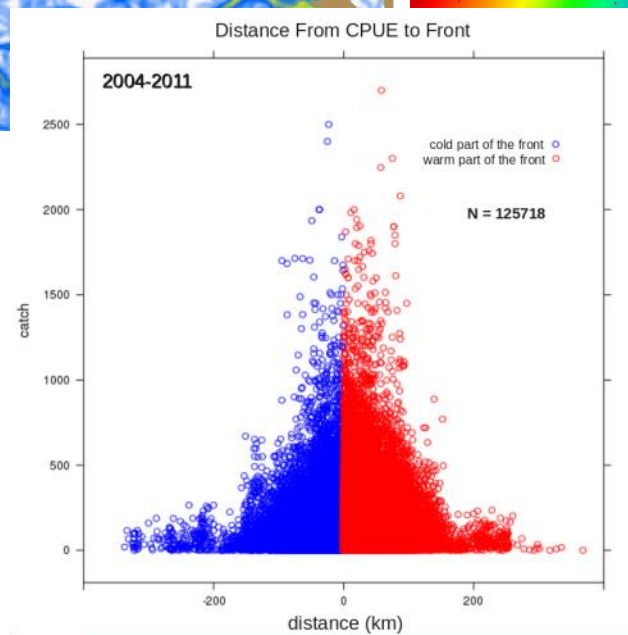
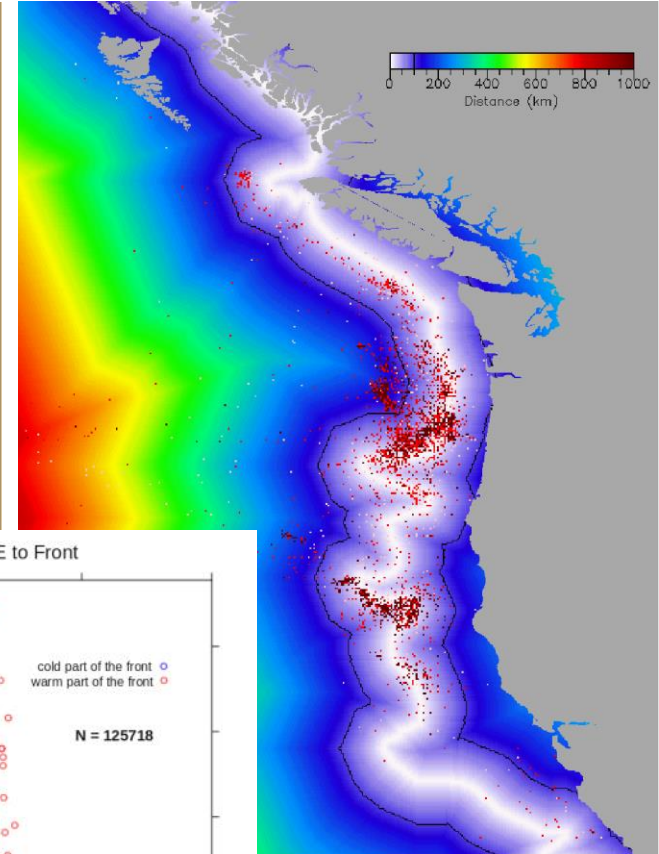
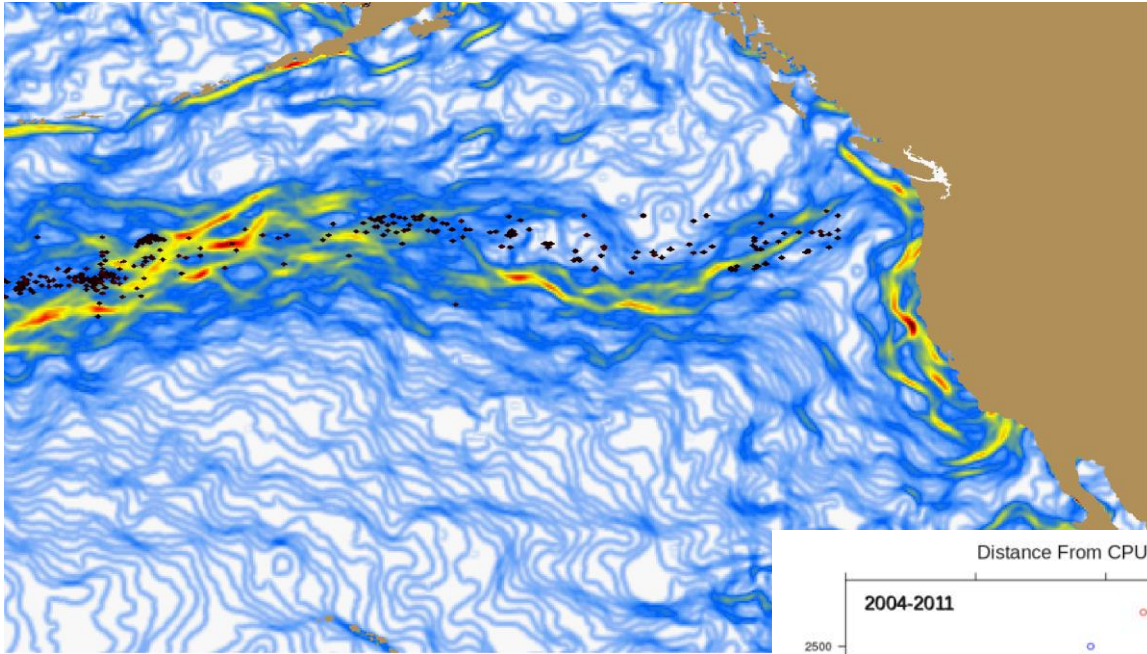
- Date, time and location
- Fish fork length
- DNA sample collected
- Sampling gear
- Vessel, Captain

Data Archives

- Individual Access and Excel databases managed by the individual researchers
- DNA data archives are managed separately
- Multiple files generated during tag testing and analysis



Albacore fishery in Relation to Coastal and Oceanic Frontal Variability



Nieto, McClatchie,
Xu and Teo in prep.

Strengths

- Good cooperation with the industry on research
- Several studies are conducted collaboratively among nations

Challenges

- U.S. fisheries only access limited sizes of fish
- Data types are disparate and difficult to archive in a standardized database

Strategies

- Strengthen capacity in other nations through workshops, mentorship and the development of standardized protocols
- Develop protocols for archiving research data so there is some consistency across projects

A large shark is captured in the middle of breaching the ocean's surface. The shark's body is arched, with its head and front fins visible above the water, while its tail is still submerged, creating a large, turbulent splash of white water. The surrounding water is a deep, clear blue. The word "Questions?" is superimposed in white text over the upper part of the image.

Questions?



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